Cement MILL SECTION of

Concrete

Vol. 28 JANUARY, 1926 No. 1

Self Unloading Bulk Freighters Aid Transportation in Cement Industry

Special Type of Ship Supplies Raw Material for Cement Plants on Great Lakes and Inland Waterways

Economies in the shipping of crushed stone and coal used in the cement and allied industries have been brought about by the use of self-unloading bulk freighters which have been put in operation on the Great Lakes. The use of these vessels and the resulting low cost of water transportation has been a factor in the location of cement plants near the market of distributing point for cement and farther away from the sources of one of the principal raw materials—limestone. The self-unloading type of bulk cargo vessel has been developed comparatively recently, and it is distinctly different from the ordinary lake vessel which is entirely void of equipment for handling cargo.

In general, "Self-Unloaders" are divided into two classes—vessels built after special designs with complete mechanical equipment for unloading entirely independent of any shore plant, and secondly, vessels converted from bulk freight ships to self-unloaders.

A paper by Henry Penton and Professor Herbert C. Sadler, read at the thirty-second general meeting of the Society of Naval Architects and Marine Engineers, outlines the developments of self-unloading bulk cargo vessels since 1907 and describes some of the leading features of these vessels, the design of which the authors of the paper were responsible for. The following article is based partly upon the paper referred to and CONCRETE is indebted to the authors and the Society for the data.

Specially Designed Self Unloaders

In 1907, to meet the requirements of a concern on the Great Lakes using annually some hundreds of thousands of tons of limestone in chemical processes, one of the authors above referred to developed a design employing a conventional single-deck, bulk-freight type of hull and installing therein a self-unloading, continuous conveyor system which delivered the cargo overside without the assistance or intervention of any form of auxiliary or shore equipment. The ship was designed for handling what is known to the trade as 4-inch stone, but the adaptability of the system to handling coal also became almost immediately apparent, and it has since been steadily employed in both trades. The first ship was placed in commission in the early summer of 1908.

Up to that time the water-borne movement of stone reached comparatively small figures and was handled almost entirely in small open barges and unloaded by shore equipment. The advent of the self-unloader gave this movement great impetus and, combined with the development of certain favorably located formations of stone of a character highly desirable for flux as well as for chemical properties, has developed a movement which by the close of 1923 had reached a volume of 10,000,000 short tons in the navigation season. Not all of this was moved by the self-unloaders, however, a considerable part being handled by ships of the ordinary type and unloaded by shore equipment, but figures for the relative proportions are not available. Similarly the figures for the self-unloaded coal are buried in the total water movement for the season of over 33,000,000 short tons. There were, up to a year ago, eleven ships of the continuous conveyor type in commission.

In general, the self-unloader in the stone and coal trades employs two horizontal conveyors, symmetrically arranged each side of the center line, delivering at the forward end, through a combining hopper, to the heel of an inclined conveyor or elevator which in turn delivers to the heel of a boom conveyor which can be swung over either side through a total arc of approximately 200°. The hold conveyors are placed immediately upon and parallel to the tank top, the forward end being carried upward to a sufficient elevation to get a proper run through the combining hopper to the center-line elevator. The heel of the latter is placed as close as possible to the peak bulkhead and sufficient rake given to insure proper feeding and discharging. The boom is pivoted on deck directly below the head of the elevator and, when not in use, is stowed and secured in chairs on the center line. It may

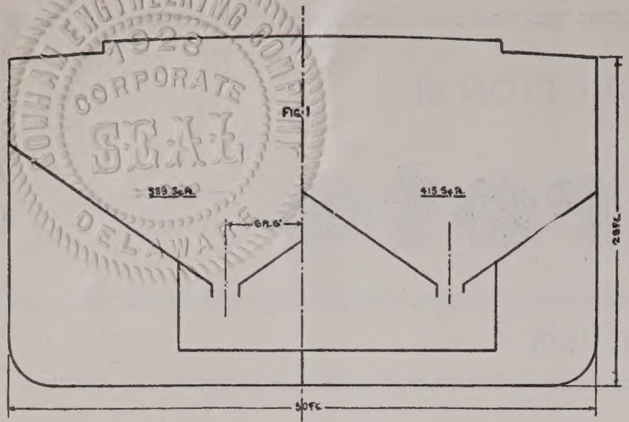


Fig. 1. Comparative diagrammatic midship section of self-unloading bulk cargo ship. The hopper bottom approximates a flattened W.

be topped up to any desired angle within the working limits, which approximate 20° from the horizontal. It may be of almost any desired length, but up to the present 150 ft. has been found to be as long as necessary with a minimum of about 85 ft. The effective delivery radius is sometimes materially increased by the addition of an apron under the outboard end. The elevator is of the chain-belt bucket type and the boom conveyor of the troughed rubber-belt type.

To obtain a flow of material to the conveyors the cargo hold is built with a bottom approximating, in cross-section, the shape of a flattened W as shown in Fig. 1. The flattest slopes at which stone would flow without some kind of agitation or disturbance was found experimentally to be 35° from the horizontal. The loss of cubic due to this construction is not important with stone, which, in the sizes commonly handled, averages about 23 cu. ft. per short ton, but with coal, at about 38 cu. ft. per short ton, the loss is substantial. To minimize this loss it would be desirable that each of the legs of the W should be of the same length, but this is impractical because of interferences forward where the hold conveyors would foul the shell and because of the greater height to which the heads of these conveyors would need to be carried to obtain a proper flow through the combining hopper to the elevator.

The least distance between the conveyors depends somewhat upon the desired capacity or unloading rate, which determines the width of the conveyors. The smallest equipment so far installed has a capacity of about 800 short tons per hour and the minimum spacing for such an installation is about 13 ft. Figure 1 illustrates the influence upon cubic of a symmetrical layout and one in which the centers are held to the minimum in a 50 x 28 foot section. The difference in favor of the symmetrical is about 1.15 tons of stone per running foot of cargo hold, and since the length of cargo hold in such a ship approximates 250 ft., the difference is substantial and in a larger ship increases rapidly. The characteristics of the section will be determined by the interferences at the head of the hold conveyors.

In effect, therefore, there exists a roomy tunnel between the conveyors under the cargo hold proper. In the bottom of the hoppers, over the conveyors, there is formed a series of hinged gates which are controlled from this tunnel. Some of the larger and more recent ships have a mechanically operated feeding mechanism added to these gates to control the flow of material. With the larger sizes of stone particularly this is sometimes an advantage, because of the tendency of the stone to bridge and the subsequent flooding of the conveyor when dislodged.

The hold conveyors are in general of two types—the pan or bucket type and the belt. Both have proven very satisfactory, and the choice is largely one of preference. The former, because of its link or chain-belt construction, can be guided in straight lines fairly close up to the delivery end and the length of slope restricted, while the latter necessarily assumes a catenary with a much longer slope. For stone cargoes only this is unimportant, but it aggravates somewhat the loss of cubic for coal.

The pioneer ship as originally built, was 286 ft. b.p., 45 ft. beam and 24 ft. molded depth. She was designed to carry about 3,300 short tons of stone on a draught of 15 ft., which was at that time the available depth at the loading terminal. As originally designed, she was equipped with two chain-belt pan conveyors delivering to an inclined belt conveyor, which in turn delivered to the boom conveyor. The inclined belt was, however, found to be unsatisfactory and was later replaced by the bucket elevator, which has been employed in all subsequent ships. The ship was subsequently lengthened to 346 ft.

The first ship employed electric drive for the conveying machinery. Some of the succeeding ships employed steam drive, but all of the later vessels have used the electric drive. Where steam is employed the prime mover is located forward, and heat losses, independent of those due to the comparatively uneconomical type of engine employed in most cases, are naturally very high and the drives very indirect. On the other hand, a strong argu-

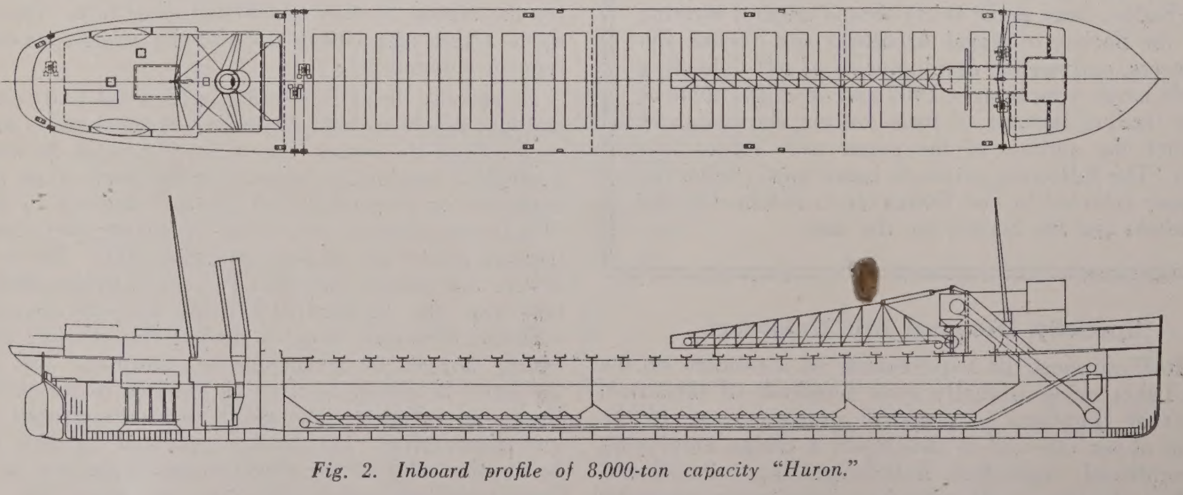


Fig. 2. Inboard profile of 8,000-ton capacity "Huron."

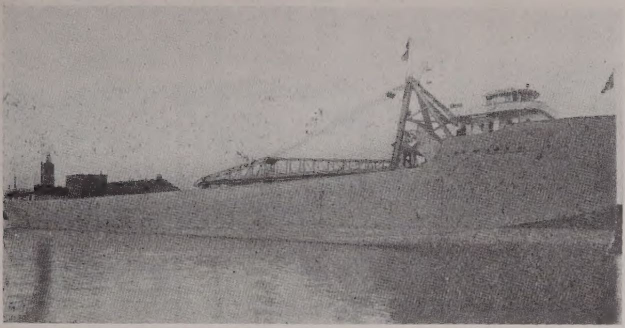


Fig. 3. The 12,000-ton ship "W. F. White."

ment in its favor has been found in its comparative simplicity and reliability and the actual hours of running are not great. The electric drive, however, in the latest as well as the largest installations has proven reliable and free from trouble and, in spite of electrical losses, much the more economical. There is also a substantial saving in weight and, further, the feature of permissible remote control of all motors and consequently of each unit of the system, is easily arranged for, so that the entire system can be controlled from on deck if desired as well as from the different stations.

Fig. 2 is an inboard profile of a ship of about 8,000 tons capacity in stone. This illustrates the general arrangement of all chain-belt conveyor ships as well as showing in a general way the form taken by the alteration in the pioneer ship. Fig. 3 is reproduced from a photo of the same ship.

Fig. 4 is an outboard profile and general arrangement and deck plan of a ship of 12,000 tons capacity in stone.

With respect to unloading rates, these vary from about 800 tons per hour in the earlier examples up to 1,800 to 2,000 tons per hour in the later and larger ships. It thus comes about that the port unloading time works out about the same for all. The unloading rate depends not only on conveyor widths and speeds, which have been gradually increased since the first installations, but also to a considerable extent upon the freedom of flow of the material. When the designers first approached the problem the size of the stone to be handled was what is known nominally as 4-in., but the sizes now handled, particularly in flux stone are much larger, and pieces are frequently met with which may reach 18 ins. to 24 ins. in one dimension. In coal also, large lumps frequently occur, and these not only lead to bridging but may have to be broken up *in situ* in order to restore flow. Provision for this is made by means of openings in the hopper sides above the gates and through which bars can be manipulated. Coal is easily disposed of, but occasionally large lumps of stone cause considerable trouble. This lack of uniformity and consequent irregularity in feeding has led to the fitting of the mechanical feeding devices before referred to. In general, the self-unloader is adaptable to any cargo which will flow by gravity and is of sufficiently hard and irregular nature to avoid interlocking and bridging for example, bricks could not be handled at all. It can not be used for the ores of the Great Lakes because of the fines and moisture, but it is perfectly adaptable for nodulized or sintered ores.

It will be apparent of course that the self-unloader suffers loss in both cubic and dead weight, and the offsets are to be found in saving in port time, total independence of any and all forms of shore-unloading plants, independence of shore labor and working conditions for fixed hours, ability to demand and collect an unloading rate in addition to her freight, ability to make delivery at any point where she can make fast and which naturally produces much business which is not available to any other type but which would not otherwise exist and which carries with it non-competitive freights. Further, she is at her best in the shorter trades because of the quick turn arounds. One of these ships has handled 110 cargoes in a season of about 240 days, taking stone in one direction and coal in another, and frequently three cargoes in a round voyage.

A projected ship of about 6,500 tons dead weight, with double boom has been designed with special reference to short trades and to cut the port unloading time in half. It has collateral advantages which will readily suggest themselves, one of which, purely mechanical, is the reduction in power required per unit of cargo because of the shorter average drag of cargo. This is important when it is known that the friction load of the system is the greater part of the average load. The additional weight of this ship, as compared with one of similar capacity of the single boom type is about 25 tons, and the loss of cubic amidship is practically offset by the gain forward: Somewhat better trim also follows, since all single boom ships trim by the stern with coal cargoes.

It will be readily apparent that the hoppered design is restricted in two directions. The high center of gravity leads to instability in ships of certain dimensions, as for example in a ship of a Welland and St. Lawrence Canal trade. Further beyond a certain point increase in beam and depth does not produce proportionate increases in cubic because of the area of cross section cut off by the

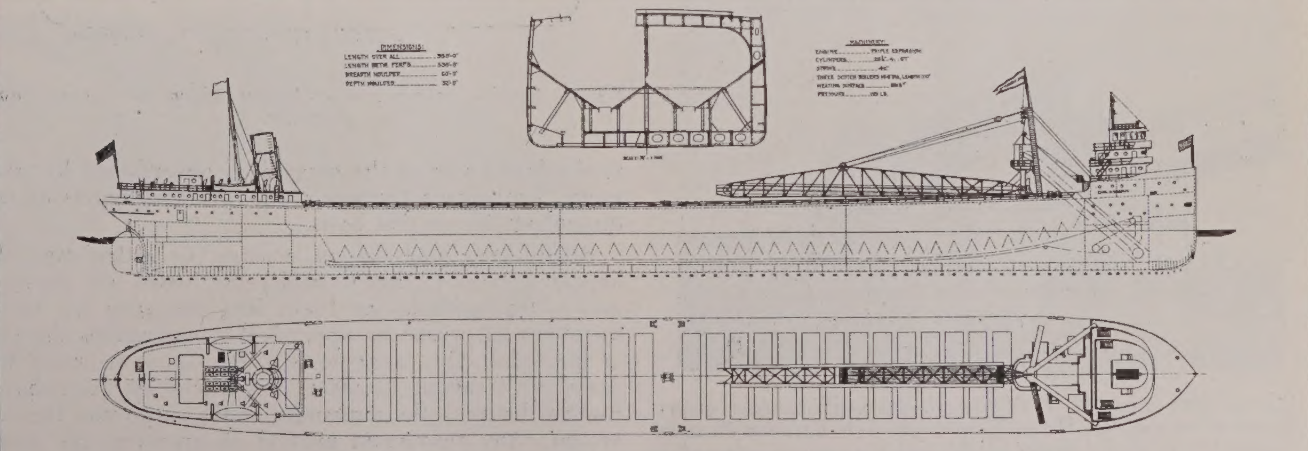


Fig. 4. Profile and deck plan of 12,000-ton self-unloading ship.

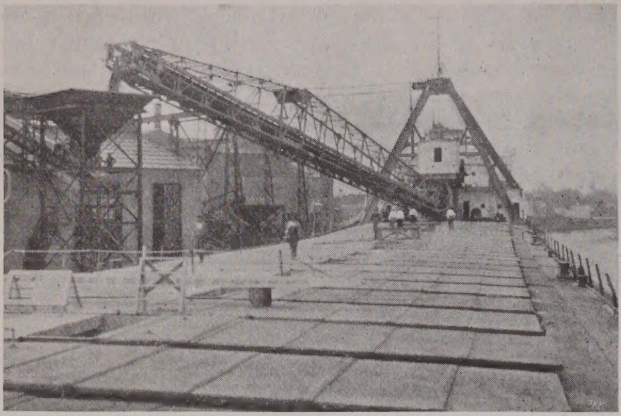


Fig. 5. The steamer "W. F. White" unloading limestone at the plant of the Peerless Portland Cement Co., Detroit, Mich. The quarry screenings from Calcite, Mich., can be unloaded at the rate of 2,100 tons per hour.

rise of hopper, and since increasing depth involve other objections, the economically largest ship of this design is probably of about the dimensions of the ship having a dead weight capacity of about 12,000 short tons. Probably few trades could employ a ship of greater capacity. This can load to her designed draught (20 ft.) with full but untrimmed holds with stone.

If some way were found to eliminate the hopper construction with fixed slope and still retain gravity flow to the conveyors, two major advantages would accrue—improved stability in vessels of restricted dimensions in trades from which the self-unloader has been barred, and reduced dimensions and weights and costs for a given cubic. Or, from another angle, since a ship of the ordinary type, if designed for full stowage with stone, will have a coal capacity of only about 60% of her dead weight ability, the same ship would be able, if the hoppering could be surpressed to carry considerably larger cargoes of coal while her entire cargo dead weight ability would be absorbed in stone with considerable cubic to spare.

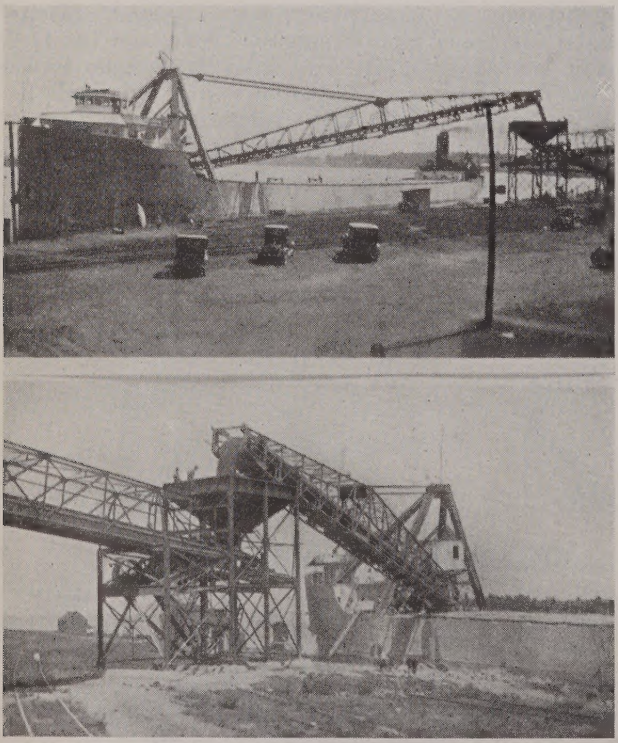


Fig. 6. Steamship "W. F. White" discharging limestone quarry screenings at the Port Huron plant of the New Egyptian Portland Cement Co. From the hopper on the dock the stone is conveyed to storage to be used, as raw material in the wet process of cement manufacture.

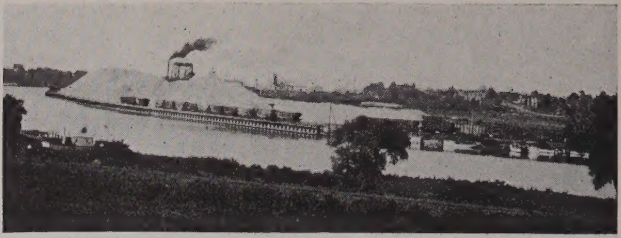


Fig. 7. Limestone delivered by steamship at Fairport Harbor, Ohio, to be transferred to the new plant of the Standard Portland Cement Co. at Painsville, Ohio.

With these ends in view one of the authors has worked out the arrangement shown in Fig. 8, an outline of the section of the 12,000 ton ship of Fig. 4. The modified arrangement which is patented, produces an increase in area of section of about 225 sq. ft., and since the length of the hold affected is about 380 ft. and of nearly uniform section, the gain in coal capacity is about 2,000 tons or about 28%. Since the increase is added entirely to the lower side of the cargo it is not affected by trimming. Untrimmed cargoes are a rule and figures quoted throughout are on that basis.

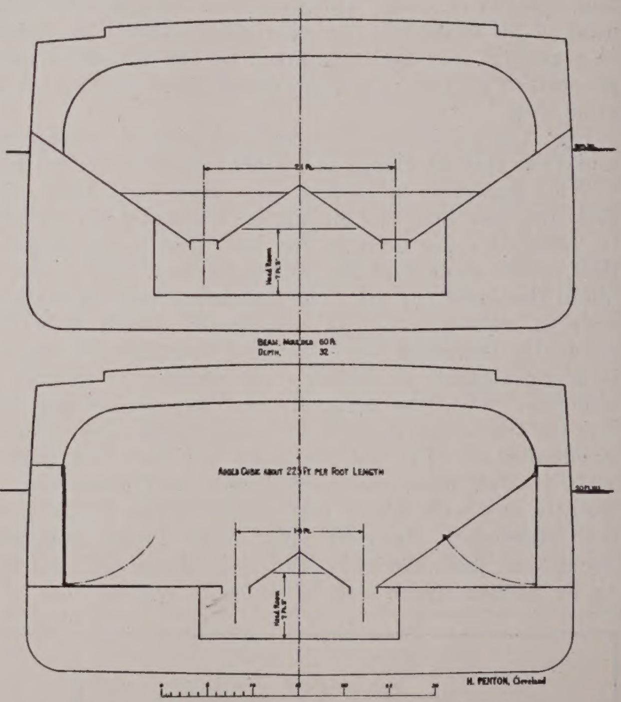


Fig. 8. Special arrangement of hopper bottom to increase cubic capacity.

Briefly, the modification consists in articulating the hopper bottom so that normally the leaves are retracted and in this position the lower leaf lies upon the flat of the side tank while the upper leaf hangs against the face of the webs. The cargo flows to the conveyors until flow ceases or is about to cease; the leaves are then moved inward dumping the remainder of the cargo into the conveyors. Any convenient method of operating the leaves may be employed. In the ship referred to they were arranged for operation by wire-rope pennants shackled at the lower hinge joint and led to line-shaft drums under the deck.

This plan allows for going back to the desirable close spacing of conveyors, in fact, that arrangement becomes more than ever desirable because it lowers the apex along the center line. Some slight hoppering here is unavoidable because of the head room necessary in the tunnel.

Unloading Rigs Built Into Standard Bulk Cargo Vessels

The second type of self-unloading vessel is the remodeled standard bulk freighter which is converted into a self-unloader by the installation of new sub-cargo unloading equipment. As the construction of a new ship is not required expressly for this type of unloading rig, many of the older vessels that seemed to have outlived their usefulness as standard carriers have been converted into self-unloaders at a low cost. It is anticipated by the designers and builders of this equipment that the future will witness a large fleet of these vessels carrying bulk materials such as stone, coal, sand and gravel into many lake ports where there are no docks equipped with unloading machinery.

The operation of the new sub-cargo unloading system designed and patented by Leatham D. Smith, Sturgeon Bay, Wisconsin, is described in the *Sauerman News*, excerpts from which follow:

Primarily the scraper unloader system consists of two tunnels built into the bottom of the hold, with a Crescent power scraper operating back and forth in each tunnel and scraping out the cargo into a hopper which feeds to a system of conveyors leading from the hopper to the shore.

The roofs of the tunnels are self-cleaning and the space between the tunnels and between the sides of the boat and the tunnels are hoppered so that the entire boat is self-cleaning. This arrangement has two definite advantages; 60% to 70% of the space wasted in hopper bottomed boats is conserved, and the cargo is carried on the ship's cargo floor which lowers the center of gravity from three to four feet and makes it possible to safely convert the standard bulk freighter with its deep water bottom tanks.

In the sides of the tunnels and extending their full length are gate openings through which the material flows by gravity into the unloading tunnels. These gates are used to control the flow of materials to the extent necessary to trim the boat and to keep divided cargoes separate. With these openings it is possible to handle non-free-flowing materials.

The scraper goes back into the tunnels far enough to get behind a full load and then moves forward as in Fig. 9, pulled by a powerful hoist, scraping out into the hopper anywhere from 4 to 10 tons of bulk, depending upon the kind of cargo and the size of the scraper. The hopper feeds the load to a troughing conveyor which delivers it to a second conveyor on the deck. This second conveyor on a swinging boom, carries the material out to dump off the end of a long arm which generally extends 150 ft. from the side of the vessel. The arm arrangement enables the boat to deposit its cargo almost anywhere as was recently demonstrated when a scraper-equipped freighter went up a river and unloaded right onto the bank. The conveyor being on a swinging boom, pivots at its receiving end so that the dumping end can be swung around to any position without stopping the unloading.

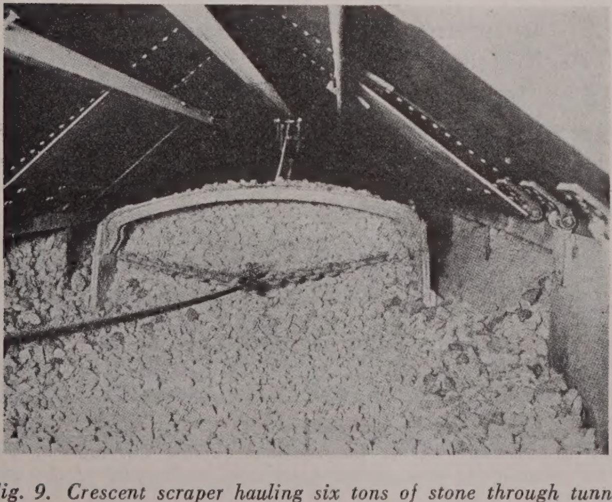


Fig. 9. Crescent scraper hauling six tons of stone through tunnel.

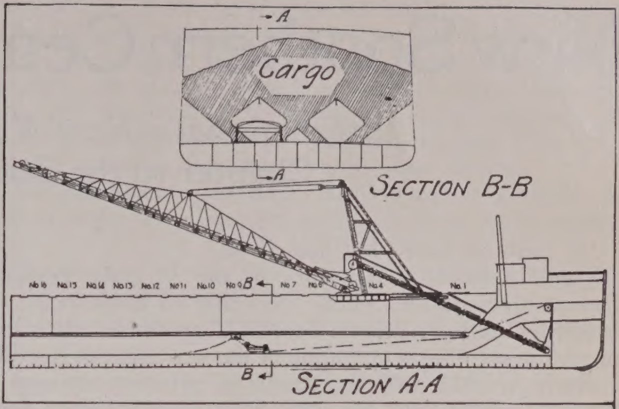


Fig. 10. Cross section diagram of a scraper-equipped freighter.

The equipment has been designed up to this time in two standard sizes. In the smaller ships of 2,000 to 3,000 tons dead weight capacity with cargo holds up to 150 ft. in length, 4-yd. Crescent scrapers are used. These are pulled by double drum steam hoists placed at the forward end of the ship on the tank top along side the foot of the scraper incline. By this arrangement the bucket is at all times visible to the operator. The scraper is pulled back into the tunnel by the back-haul cable which leads to the after end of the ship. The cable comes up the tunnel and is rove through an overhead trolley on an I-beam, then through a sheave on the back of the scraper and dead-ended on the trolley.

This reave of cable lifts the returning light scraper over the cargo which flows into the tunnel from both sides. Slacking the back-haul cable lowers the scraper on the material. The load cable then pulls the scraper forward and shoves the material up the scraper incline into the hopper which feeds the inclined troughing conveyor. With the 4-yd. scrapers, a 40-in. inclined troughing conveyor belt and a 36-in. swinging boom conveyor are used.

In the larger boats, ranging from 3,000 to 6,000 tons deadweight capacity, with cargo holds from 150 to 250 ft. in length, 8-yd. Crescent scrapers are used. These will hold 6 tons of coal or 10 tons of stone. The same arrangement of equipment prevails as with the 4-yd. outfits, only a 54-in. inclined conveyor belt and a 48-in. swinging conveyor are used.

The speed of the loaded scraper ranges from 200 to 250 feet per minute and the maximum back-haul speed is 400 to 500 feet per minute. The average unloading capacity is 700 tons per hour with a peak capacity of 1,000 tons at some stages of the unloading, the advantage of the 8-yd. scraper in the larger boats being offset by the correspondingly longer length of tunnel and consequently longer haul for the scraper.

New Southern Cement Plant Completed

International's New Virginia Plant Adds Another Chapter to the Science of Cement-making

"It can't be done—but here it is!"

That, in brief, is the story of the Virginia Portland Cement Corporation, where according to Bulletin No. 5, issued by the International Cement Corporation, all is now in readiness to begin operation of the new plant at Norfolk.

Early in 1924, with the details of previous attempts to produce cement from the available materials before them, International engineers made a preliminary examination of the property. Convinced that a cement could be produced at Norfolk which would not only meet United States Standard Specifications, but could actually be made to exceed those standards by a wide margin, the property was acquired.

Then followed an exhaustive study of raw materials, and the development of plans, unique in many ways, to insure quality and uniformity. This preliminary effort took six months.

Actual construction then began on what is now regarded as one of the country's outstanding cement plants. Work has been carried forward deliberately. Thoroughness has in every case had precedence over speed. The quality of the product and not the desire to produce cement at the earliest possible date has been the foremost consideration.

While putting the finishing touches on the plant, trial runs of cement have been steadily subjected to the most severe tests demanded by the International Standards. These tests confirm preliminary analyses, and show that in both quality and uniformity Lone Star Cement produced at Norfolk attains the same super-grade that is standard throughout the International System.

The problem which had baffled cement men for 15 years has been solved. Here are four outstanding reasons:

1. Better Raw Materials

The lime content of Lone Star cement produced at Norfolk is obtained from the marl deposits of Chuckatuck, located on the Elizabeth river, twenty-five miles above the plant.

A very high-grade clay, especially suited for cement manufacture at Norfolk, is brought from Waverley, Va., 60 miles from the plant.

2. Preparation of Raw Material

Geologists estimate that the shells which comprise the marl deposit at Chuckatuck were laid down thousands of years ago. A lot of water has gone over the dam since then, and it has deposited various foreign substances upon the marl.

Solving the problem of separating this foreign material from the marl has paved the way for the production of a super-grade cement at Norfolk.

For this purpose, an ingenious classification and "washing" process has been installed in a new plant erected at Chuckatuck. The marl is pulled out of the deposit, four tons at a time, by a drag-line and shovel attached to a huge 143-ft. boom, loaded onto cars, hauled to a hopper, and thence on a conveyor belt is carried to a grizzly.

The grizzly separates the fine and coarse material, the coarse pieces being delivered to a gyratory crusher, which reduces it in size, while the finer particles pass through the grizzly into a trommel.

The trommel is a huge circular sieve, having half-inch holes. This sieve is partially submerged in water and performs the double duty of separating and washing in one operation.

The material leaving the trommel is gathered by a raking device in a classifier which drags it through the water and up an inclined trough. The cleansing is facilitated by the abrasive action of the particles of marl tumbling against each other, while this raking device by constantly agitating the water, causes the water to hold in suspense and steadily carry off the fine particles of foreign matter.

As the marl reaches the upper part of the incline it is subjected to a heavy spray of clean water, which exerts a powerful scrubbing action and further cleanses the material.

The raking device also acts as a conveyor, pushing the clean marl into a hopper which delivers it onto a belt conveyor whence it goes to the barges to be carried to the mill at Norfolk.

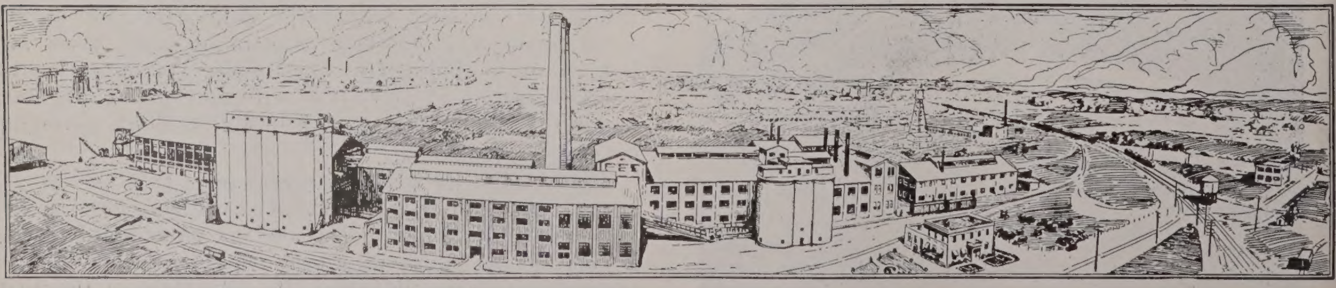
So thorough is this washing operation that the marl emerges as perfect lime, ideal for the production of a super-grade cement.

3. Modern Cement-Making Apparatus

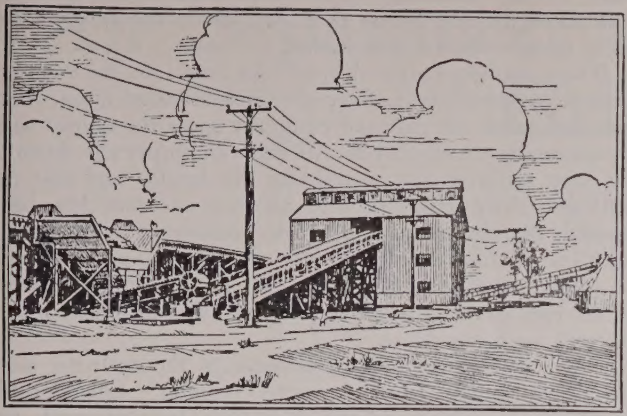
The plant at Norfolk is new in its entirety. Twenty-five years' experience in plant construction and operation and the employment of the most modern equipment, combine to make this mill the last word in efficiency.

4. International Wet-blending Process

The Norfolk plant employs the International wet-blending process, one of the outstanding achievements in cement



The new Norfolk plant of the Virginia Portland Cement Corporation, a subsidiary of the International Cement Corporation. The efficiency of this plant is attributed to 25 years' experience in plant construction and operation and the employment of the most modern equipment.



The new washer at Chuckatuck where the marl deposit, used at the new Virginia plant, is located.

manufacture. Continuous tests for quality are employed as an integral part of this process. At Norfolk, as at other International plants, the laboratory controls the product. The chemist maintains constant supervision. He lives with the product; his function is as the navigator of the ship—he sets the course from which there is no deviating, no matter what expediency might dictate.

The manufacture of Lone Star cement at Norfolk, as well as at the other International plants, is an exact science.

* * *

The product of this new plant will be marketed under the International policy—

"To deal with each customer as though both buyer and seller were members of the same organization."

The Norfolk plant is located on the Elizabeth river. A 30-ft. deep channel, with adequate wharfage, affords the advantage of water transportation. In addition, the plant is located on a belt line which gives access to the principal railroads.

Hazards of Standard and Narrow Gauge Railroad Equipment in Quarries

By W. W. STEWART

Sales Manager, Koppell Industrial Car & Equipment Company

The operation of railway equipment confronts us with hazards requiring much prudence and care to overcome, and our efforts toward "Safety" lead us to thorough investigations of the factors—"Cause, Effect and Remedy." We know the "Cause" is primarily carelessness and neglect, and we know that the "Effect" is sometimes appalling but the "Remedy" we must work out to our own salvation.

Standard gauge railroads, as well as most of the industrials, have been relentless in their crusade against accidents; educating their employees, as well as the public, to their ideals of "Safety" and statistics will show that their efforts have been highly rewarded.

For operation of equipment, the standard gauge railroads have their standard rules and regulations to govern application of safety appliances for interchange but for the industrials, or narrow gauge railways, it is practically impossible to establish one set of standards applicable to all industries, as each industry has conditions peculiar to its particular line of work.

In the quarries we encounter extreme hazards as we are obliged to combat such elements as very poor track conditions with heavy grades and inclines; overloading of cars; improper loading of cars; excessive spotting of cars; handling of cars having high center of gravity necessary to insure proper dumping and the use of the link and pin couplers.

In reference to track conditions, the standard gauge railroad equipment requires the use of heavy rails, and as the cars have double trucks they will ride very uneven tracks, whereas, the narrow gauge equipment requires lighter rails and smaller cars with single truck construction, considerable difficulty is experienced to keep cars on the track. To maintain perfect road bed would require considerable expenditure because just as soon as the steam shovel has made one cut, it is necessary to move this track over to the face of the quarry, however, it is true that the high and low spots, loose joints, crooked rails, proper elevation on curves and widening of track gauge at the curves should be taken care of in the quarry, thereby, reducing to a minimum the possibility of derailments and wrecks.

Danger in Overloading Cars

A very common practice in quarry work, is the overloading of cars and loading of cars heavy on one side to facilitate dumping, both of which are detrimental to safety. The ideal quarry car to withstand heavy quarry service must have body construction to stand abuse occasioned by dropping of large rocks from the steam shovel dipper and must have stability of frame required for handling cars in trains, yet sufficient flexibility to insure satisfactory operation on uneven tracks, and where side dump cars are used the design requires a very high center of gravity to secure proper dumping angle. When such cars are in transit the unevenness of track causes considerable swaying of the cars, resulting in spilling of the load; subsequent derailment, and ultimately, loss of production to the manufacturer; property damage to tracks and cars and possible chance of injury to workmen.

Coupler Hazards

One of the greatest hazards of railway equipment in quarries is the use of the link and pin couplers. On standard gauge equipment the automatic coupler is used almost universally, however, the larger equipment generally operates on heavy rails and large radius curves, whereas, the narrow gauge equipment must operate on light rails and very small curves. The automatic coupler is limited to a certain extent in its ability to function properly and still take care of the vertical and lateral motion due to unevenness and curvature of track, but the link and pin coupler permits wide clearances and will function under adverse conditions, however, the coupling of cars

---

From a paper presented at the Fourteenth Annual Safety Congress of the National Safety Council, Cleveland, O., Sept. 28-Oct. 2, 1925.

requires adjusting the link into proper position when cars come together, and this operation sometimes results in injury to workmen.

Further, the coupler, in addition to being the means of coupling cars together is also part of the drawbar and is subject to severe shocks and strains. Also the hauling of cars on inclines with cable hooked into the coupler and "spotting" of cars, requiring considerable jerking of trains both work hardship on the couplers and draft gear.

The general practice on draft gear with automatic couplers is to use a lipped yoke at the coupler, however, on small narrow gauge cars a yoke cannot always be used, then the split tail coupler is substituted. This split tail coupler requires the use of a pin at the end of the coupler shank and this pin is not always accessible, therefore, on cars with this type of coupler the draft gear should be subject to periodical inspection and frequent replacement of this particular pin.

Oil Journal Boxes

Another small detail which if given proper attention will eliminate considerable hazard, is the oiling of the journal boxes. Most quarry men believe that the oil should be inside the journal box and this is correct but—why not put a little oil on the outside of the box where the box rubs the pedestals? This would insure free movement of the boxes in the pedestal guides when the springs are compressed and if proper clearance has been provided between the bottom of the box and the pedestal tie bar, the wheels will ride the high and low spots in the tracks reducing to a minimum the possibility of the flanges of the wheels climbing over the heads of the rails causing derailment and possible injury to workmen.

Here is a case where on a certain day a quarry car jumped the track on a sharp curve. The foreman instructed a track worker to jack the track at this particular place and that he, the foreman, would go to the quarry supply house and secure some new spikes. This quarry foreman failed to instruct the locomotive engineer that work was being done on this curve and he also failed to place any warning sign, such as red flag or otherwise showing that work was being done. Before the foreman returned from the supply house with the spikes, the locomotive pushing a train of empty cars ahead of it, on its way back to the steam shovel, ran over and killed this track worker.

Incline Hazards

Where the stone is being conveyed from the quarry up an incline to the crusher, you will find at the foot of the incline two tracks, one on which the loads are pushed in and the other track for the empties to be lowered from the mill. On a certain day an employer was short one man and this man happened to be the regular cable hooker. The cable hooker is known as the man who hooks the cable to the car at the foot of the incline.

The quarry locomotive was pushing in a train load of stone from the steam shovel and when the cable hooker was in the act of hooking to a car, pushed them up on this man. This accident resulted in a permanent and total disability claim. This particular employer has been paying compensation to the injured man for a period of two years, and from all indications, will continue doing so for the life of this man.

An accident that seems to be quite common in some of the quarries is where the hoist man lets the empty car down the incline and it bumps into other empties at the foot of the incline, and when one of the employees is coupling up the empty, receives an injury to his fingers or hand caused by bumping and he deliberately uses his hand between the couplers when the cars come together. This man should have used a hook for guiding the link into the coupler, and the hoist man should have been more careful in dropping the cars down the incline and not allowed them to run down so far on the empty track as to bump into the cars at rest.

When loading material from the bins into the railroad cars, it is customary to have the track elevated upon which elevated track the railroad company spots the empty cars. Occasionally an employee will drop an empty car down to the bins without first examining the brakes and this car will get away crashing into another car that has been loaded, thereby causing a wreck, sometimes a derailment with loss of time and frequently an injury to an employee. It appears that proper instructions by the superintendent to the employee, to properly inspect this equipment would prevent such accidents.

There is another feature relative to the railroad company's equipment which is quite common. Considerable equipment is placed at the industry's loading track not properly cleaned out and it is necessary for the loader to have one of his employees clean these cars. To clean these cars it is necessary to drop the hopper. A great many stone producers are using the old style hopper wrench and if they would use what is known as a safety hopper wrench a good many accidents could be prevented.

Take the case of a certain stone plant in Ohio where a carload of coal was received in a hopper, and the employee was sent to dump this carload of coal on the coal dump using the old type wrench. There is a certain amount of tension on the locks of the hopper and when released the wrench flew around, striking the man and causing injury, but with the right kind of equipment to open this hopper this accident would never have occurred.

At some quarries considerable stone is being moved by motor trucks and in many cases it is necessary for these trucks to drive under the bins where the railroad cars are loaded and where the dinky locomotive travels back and forth moving this railroad equipment. In these particular cases the operators should use extreme caution to prevent damage to the trucks or injury to the driver. In one case a car being spotted for loading got away and crashed into a truck which was being loaded underneath the bins. In the truck driver's endeavor to get away he was pinned between the truck and the railroad car and killed. With a little more care this accident could have been prevented.

To overcome or even minimize, the hazards of operating railway equipment in quarries it would seem that the most feasible plan would be the selection of competent employees for this class of work; proper caution instruction with strict rules; enforcement of the rules; use of conspicuous warning signs; periodical inspection of equipment and frequent inspection of reciprocating parts to detect sharp flanges on wheels, worn or defective parts, thereby, protecting our fellow man and adhering to the morals of safety.

Poland Has 14 Cement Plants

Persons interested in cement have found natural conditions of Poland are favorable to the development of the industry, says the American Polish Chamber of Commerce and Industry.

Principal ingredients necessary for the manufacture of Portland cement—namely, limestone and clay—are found in Poland in great abundance. In the southwestern part of the country there are rich strata of high-grade limestone free from admixtures and forming an excellent material for the manufacture of cement.

Coal dust finds a large market in the cement factories and, being the superfluous and consequently cheapest species of coal, is freely supplied by the upper Silesian and Dabrowa coal mines. There are fourteen cement factories in Poland. The center of the industry is situated in the coal basin.

Air Separation in Conjunction with Grinding

By G. F. METZ
Hardinge Co., Inc.

(Concluded from the December, 1925, issue of the Cement Mill Section of CONCRETE)

Centrifugal Selector

The third type of machine which has recently been placed on the market is somewhat similar to the centrifugal separator just described, but uses a slightly different method to obtain the separation. This machine is known as the Centrifugal Selector. The material from the grinding mill is elevated and fed through the top of the selector onto a revolving distributing plate where it is distributed in a thin layer and whirled so that every grain is torn apart from adhering contacts, it is then air swept by means of a fan the speed of which can be varied so that any combination of centrifugal force with air suction can be definitely maintained. The opening at the top of the separating chamber can also be varied to adjust the fineness. With this machine, due to centrifugal force, the heavier particles are found near the outside of the distributing plate and the fines near the center. Air suction is maintained so as to lift only a product of the fineness desired.

All of these classifiers are efficient machines and the latter two which operate at relatively slow speed are particularly adapted for use in connection with preliminary grinders, grinding abrasive materials, which discharge a great deal of relatively coarse material along with considerable fines and where it has been found advantageous to remove finished material at this point in order to relieve the finishing grinding mills. This coarse abrasive material has a tendency to cause great wear on air separation systems using high velocities, especially where the latter are used as auxiliaries to the grinding mills. The slow speed classifier takes slightly less power than the high velocity system.

One of the chief disadvantages in connection with the use of this classifier, however, is the fact that it is necessary to use an elevator to lift the mill discharge to the feed of the classifier and frequently where head room is at a premium, a screw or belt conveyor has to be installed to feed the tailings back to the mill. All of these auxiliaries complicate the layout and make more equipment to maintain.

Classifier Increases Grinding Capacity

The classifier or air separators attached to and offered as an integral part of the grinding mill, whether it be high speed roll or ball type, tube mill or slow speed conical mill using air to separate and convey the product, materially increases the grinding capacity of these mills in that the air suction immediately removes a particle when it has been reduced to the proper fineness, thereby relieving the mill of this material and leaving the grinding media free to act on coarser material. This is not true of auxiliary air classifiers as with their use especially in ball or tube mills a great deal of the material is finished to the proper size after it has progressed through the first few feet of the mill. This fine material remains in the mill the remaining distance until it is discharged, all the while cushioning the action of the grinding media and hindering the grinding action toward the discharge end of the mill. It is only after the mill product goes through the air classifier that the fines are eliminated and then when making very fine products, at lower separation efficiencies which, of course, means a great deal of fines being returned with the oversize thus hindering the grinding action.

Where the entire system is under suction it is possible to maintain an absolutely dustless condition. The finished material is delivered under pressure direct to finished material bins usually eliminating another elevator. Power used is slightly higher than with the slower speed auxiliary classifiers, but this is usually compensated for by the increased capacity obtainable from the grinding mill due to the air suction relieving the mill of the finished material as soon as it is formed. The integral or unit system occupies less floor space and slightly less headroom.

From the foregoing comparisons it becomes apparent that the combination of slow speed heavy duty grinding machinery with a unit air separating system employing the principle of air suction with direct classification offers attractive possibilities to many problems not satisfactorily handled by other methods.

In conclusion, it is evident that there are two distinct methods of air classification and conveying, the unit, comprising a combination of grinding mill, air separator and pneumatic conveyor, and the other comprising three separate units, the mill, bucket elevator, slow speed air separator or classifier. Each method has its advantages and best fields of use as will be apparent upon close analysis of the various requirements and attendant problems that could use the one or the other form of air separation or classification to considerable advantage.

Due to inclement weather, the cement mills within the territory of the Great Lakes Regional Advisory Board will require for their loading during the next 90 days about 5% less cars than were used the same period last year, it was reported by J. C. Graham, chairman of the cement committee at the meeting of the board in November last. It is not possible to store shipments of cement in advance, as cement will not store in the fall. The present car supply has been adequate, with road haul and terminal movement good. The campaign to bring about more prompt loading and unloading of equipment is progressing very satisfactorily. The committee received no complaints for action before the Board, nor were there any problems within the industry to be brought to the Board's attention. As regards service, however, it was suggested that individual lines serving the various cement plants endeavor to move this commodity promptly, to insure a continuance of the tonnage which might otherwise move from a plant on a competing line. In the cement industry service is the first requisite with dealers. It was reported that 80% of the year's production had already been transported and the general condition of the entire industry was reported satisfactory.

Tables for Rapidly Calculating Quarry Charges

Three Tables and a Chart Provide Quick and Convenient Method of Calculating Charges for Any Quarry Shot

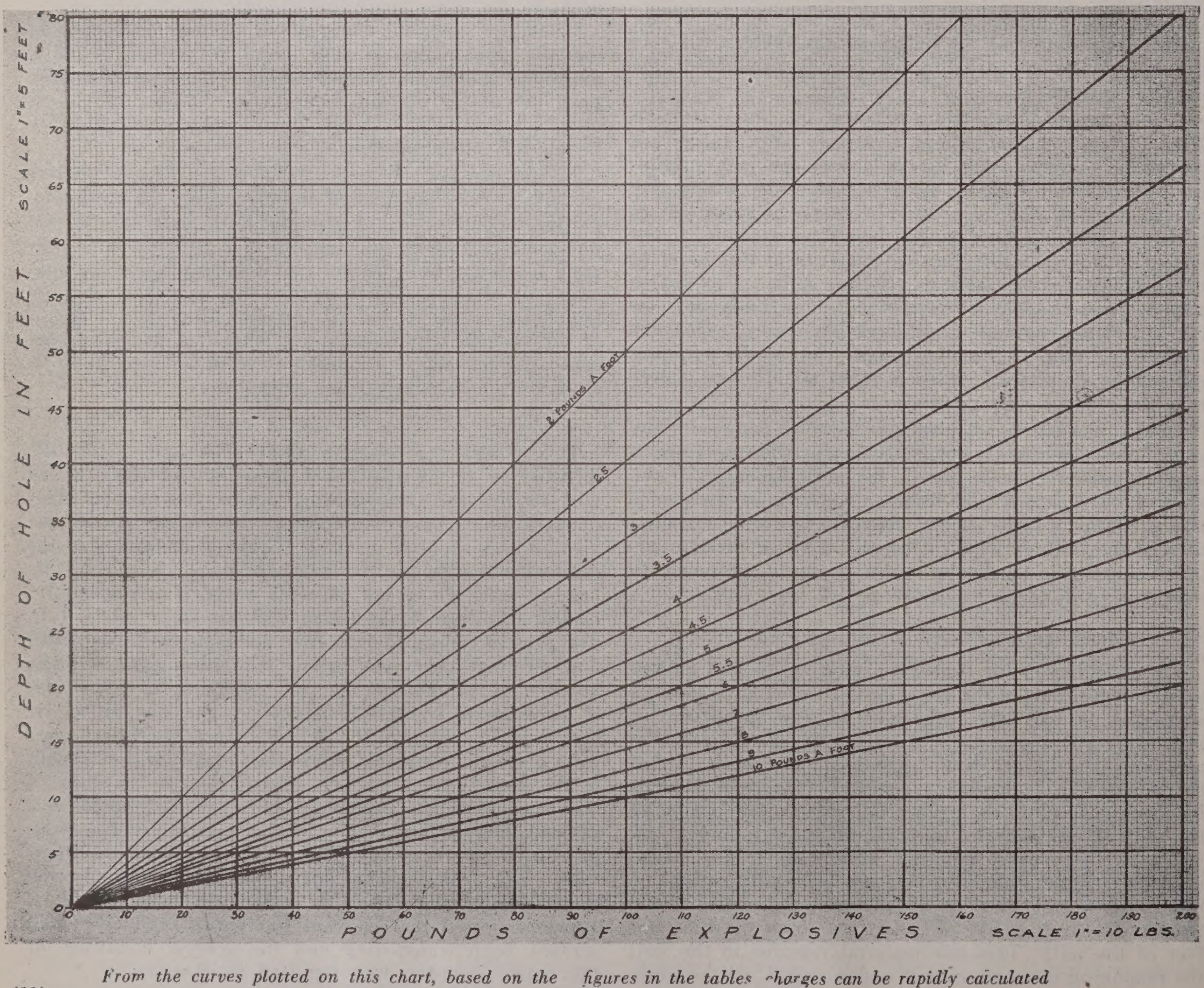
By J. BARAO

From the *Explosives Engineer*

To the quarryman who has had to laboriously work out through complicated mathematics the amounts of explosives he must load, the value of an easy system of tables abolishing the greater part of his effort is apparent. Although at first glance these tables may appear somewhat involved, actually their use is simple and convenient.

The first two will probably not be needed frequently because it is the general practice in the majority of quarries to space the holes at regular intervals. Therefore, the calculation of the number of cubic yards for each foot of hole needs to be repeated only when changes in spacing occur. Also if the explosive factor is constant this requires determination but once, or when conditions influencing the explosive factor change. The last table, or the curve, must be referred to constantly, because the depth of holes is usually the most changeable factor in quarry blasting.

By measuring the distances between holes and the burden on each, it is possible to obtain from the first table the number of cubic yards of solid rock burden on each foot of hole. The second table ascertains for each foot of depth, the pounds of explosives for different



From the curves plotted on this chart, based on the figures in the tables charges can be rapidly calculated

Pounds of Explosives per ft. of Hole

TABLE NO. 2

Cu. Yds. per Ft. of hole	Explosives Factor Per Solid Cu. Yd.										
	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80
3	0.9	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.4
4	1.2	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.2
5	1.5	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.0
6	1.8	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50	4.8
7	2.1	2.45	2.80	3.15	3.50	3.85	4.20	4.55	4.90	5.25	5.6
8	2.4	2.80	3.20	3.60	4.00	4.40	4.80	5.20	5.60	6.00	6.4
9	2.7	3.15	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75	7.2
10	3.0	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50	8.0
11	3.3	3.85	4.40	4.95	5.50	6.05	6.60	7.15	7.70	8.25	8.8
12	3.6	4.20	4.80	5.40	6.00	6.60	7.20	7.80	8.40	9.00	9.6
13	3.9	4.55	5.20	5.85	6.50	7.15	7.80	8.45	9.10	9.75	10.4
14	4.2	4.90	5.60	6.30	7.00	7.70	8.40	9.10	9.80	10.50	11.2
15	4.5	5.25	6.00	6.75	7.50	8.25	9.00	9.75	10.50	11.25	12.0
16	4.8	5.60	6.40	7.20	8.00	8.80	9.60	10.40	11.20	12.00	12.8
17	5.1	5.95	6.80	7.65	8.50	9.35	10.20	11.05	11.90	12.75	13.6
18	5.4	6.30	7.20	8.10	9.00	9.90	10.80	11.70	12.60	13.50	14.4
19	5.7	6.65	7.60	8.55	9.50	10.45	11.40	12.35	13.30	14.25	15.2
20	6.0	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.0
21	6.3	7.35	8.40	9.45	10.50	11.55	12.60	13.65	14.70	15.75	16.8
22	6.6	7.70	8.80	9.90	11.00	12.10	13.20	14.30	15.40	16.50	17.6

Where the explosives factor is known, the two tables on this page, together with the table on page 335, enable one to quickly arrive at the pounds of explosives to load.

Pounds of Explosives for Varying Depths

TABLE NO. 3

Lbs. Per Foot	Depth of Holes											
	12	14	16	18	20	22	24	26	28	30	32	34
1	12	14	16	18	20	22	24	26	28	30	32	34
1.5	18	21	24	27	30	33	36	39	42	45	48	51
2.0	24	28	32	36	40	44	48	52	56	60	64	68
2.5	30	35	40	45	50	55	60	65	70	75	80	85
3.0	36	42	48	54	60	66	72	78	84	90	96	102
3.5	42	49	56	63	70	77	84	91	98	105	112	119
4.0	48	56	64	72	80	88	96	104	112	120	128	136
4.5	54	63	72	81	90	99	108	117	126	135	144	153
5.0	60	70	80	90	100	110	120	130	140	150	160	170
5.5	66	77	88	99	110	121	132	143	154	165	176	187
6.0	72	84	96	108	120	132	144	156	168	180	192	204
6.5	78	91	104	117	130	143	156	169	182	195	208	221
7.0	84	98	112	126	140	154	168	182	196	210	224	238
7.5	90	105	120	135	150	165	180	195	210	225	240	255
8.0	96	112	128	144	160	176	192	208	224	240	256	272
8.5	102	119	136	153	170	187	204	221	238	255	272	289
9.0	108	126	144	162	180	198	216	234	252	270	288	306
9.5	114	133	152	171	190	209	228	247	266	285	304	323
10.0	120	140	160	180	200	220	240	260	280	300	320	340
10.5	126	147	168	189	210	231	252	273	294	315	336	357
11.0	132	154	176	198	220	242	264	286	308	330	352	374
11.5	138	161	184	207	230	253	276	299	322	345	368	391
12.0	144	168	192	216	240	264	288	312	336	360	384	408
12.5	150	175	200	225	250	275	300	325	350	375	400	425
13.0	156	182	208	234	260	286	312	338	364	390	416	442
13.5	162	189	216	243	270	297	324	351	378	405	432	459

DISTANCE HOLES ARE SPACED APART IN FEET—TABLE NO. 1

DISTANCE HOLES ARE SET BACK FROM FACE IN FEET	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
7	1.81	2.0	2.33	2.7	2.85	3.11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
8	2.0	2.37	2.65	2.96	3.26	3.55	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
9	2.33	2.65	3.0	3.33	3.66	4.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
10	2.7	2.96	3.33	3.7	4.1	4.44	4.81	5.18	5.55	5.92	....	....	....	....	....	....	....	....	....	....	....	....	....	....
11	....	3.26	3.66	4.1	4.48	4.88	5.3	5.7	6.11	6.52	....	....	....	....	....	....	....	....	....	....	....	....	....	....
12	....	....	4.0	4.44	4.88	5.33	5.77	6.22	6.66	7.11	7.55	....	....	....	....	....	....	....	....	....	....	....	....	....
13	....	....	....	4.81	5.3	5.77	6.26	6.74	7.22	7.70	8.18	....	....	....	....	....	....	....	....	....	....	....	....	....
14	....	....	....	5.18	5.7	6.22	6.74	7.26	7.77	8.30	8.81	9.33	9.85	10.37	....	....	....	....	....	....	....	....	....	....
15	....	....	....	5.55	6.11	6.66	7.22	7.77	8.33	8.88	9.44	10.0	10.55	11.11	11.66	12.22	12.78	13.33	13.88	14.44	15.0	15.55	16.1	16.66
16	....	....	....	....	....	7.11	7.70	8.30	8.88	9.48	10.07	10.66	11.3	11.85	12.44	13.03	13.63	14.22	14.81	15.74	16.45	16.60	17.18	17.77
17	....	....	....	....	....	7.55	8.18	8.81	9.44	10.07	10.70	11.33	11.96	12.59	13.22	13.85	14.48	15.11	15.74	16.37	17.0	17.63	18.26	18.88
18	....	....	....	....	....	8.0	8.66	9.33	10.0	10.66	11.33	12.0	12.66	13.33	14.37	14.66	15.33	16.0	16.66	17.33	18.0	18.52	19.33	20.0
19	....	....	....	....	....	....	9.15	9.85	10.55	11.3	11.96	12.66	13.37	14.07	14.77	15.43	16.18	16.88	17.60	18.30	19.0	19.70	20.40	21.11
20	....	....	....	....	....	....	9.63	10.37	11.11	11.85	12.59	13.33	14.07	14.81	15.55	16.30	17.03	17.77	18.51	19.26	20.0	20.74	21.48	22.22
21	....	....	....	....	....	....	....	....	11.66	12.44	13.22	14.37	14.77	15.55	16.33	17.11	17.88	18.66	19.44	20.22	21.0	21.77	22.55	23.33
22	....	....	....	....	....	....	....	....	12.22	13.03	13.85	14.66	15.48	16.30	17.11	17.92	18.74	19.55	20.4	21.18	22.0	22.83	23.63	24.44
23	....	....	....	....	....	....	....	....	12.78	13.63	14.48	15.33	16.18	17.03	17.88	18.74	19.59	20.44	21.39	22.14	23.0	23.85	24.7	25.55
24	....	....	....	....	....	....	....	....	13.33	14.22	15.11	16.0	16.88	17.77	18.66	19.55	20.44	21.33	22.22	23.11	24.0	24.88	25.77	26.66
25	....	....	....	....	....	....	....	....	13.88	14.81	15.74	16.66	17.60	18.51	19.44	20.4	21.39	22.22	23.14	24.07	25.0	25.92	26.88	27.77
26	....	....	....	....	....	....	....	....	14.44	15.74	16.37	17.33	18.30	19.26	20.22	21.18	22.14	23.11	24.07	24.66	26.0	26.96	27.92	28.88
27	....	....	....	....	....	....	....	....	15.0	16.00	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
28	....	....	....	....	....	....	....	....	15.55	16.60	17.63	18.52	19.70	20.74	21.77	22.83	23.85	24.88	25.92	26.96	28.0	29.03	30.81	31.11
29	....	....	....	....	....	....	....	....	16.1	17.18	18.26	19.33	20.40	21.48	22.55	23.63	24.7	25.77	26.88	27.92	29.0	30.07	31.14	32.22
30	....	....	....	....	....	....	....	....	16.66	17.77	18.88	20.0	21.11	22.22	23.33	24.44	25.55	26.66	27.77	28.88	30.0	31.11	32.22	33.33
31	....	....	....	....	....	....	....	....	....	....	....	....	....	....	23.74	25.26	26.4	27.55	28.7	29.85	31.0	32.14	33.29	34.44
32	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24.88	26.74	27.59	28.44	29.63	30.81	32.0	33.18	34.37	35.55
33	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	28.26	29.33	30.55	31.77	33.0	34.22	35.44	36.66
34	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	31.48	32.74	34.0	35.25	36.51	37.77
35	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	32.4	33.7	35.0	36.29	37.59	38.88

Number Cubic Yards of Material in the Solid Displaced per Foot of Hole at Different Spacings for Vertical Faces.

explosives factors. From actual experience the explosives factor for each cubic yard of material must be found, after which the pounds of explosives in each foot of hole can be readily obtained with the first two tables. Pounds of explosives for variations in the depth of holes can be found in the last table. Charges can also be calculated from the curves shown herewith, which have been plotted from the figures in the tables.

After computing the pounds of explosives needed per foot of hole, the total charge per hole can be secured by the use of these curves.

The following example shows how the tables may be used in calculating charges. We will assume that we have an explosive factor of 0.6 pound of explosives per cubic yard of burden to be removed. The holes are 28 ft. deep, and are spaced 16 ft. from the face and are 12 ft. apart.

In Table 1 we find that the number of cubic yards of material in the solid displaced per foot of hole for a 12 x 16 spacing, are 7.11.

In Table 2, in the eighth vertical column, which is headed by the explosives factor .60, we find 4.20 opposite the figure 7. Farther down opposite 11, we find 6.60. Then 4.20 plus 1/100 of 6.60, or .0660 equals 4.26 pounds of explosives per foot of hole.

We then refer to table No. 3. The columns are headed "Depth of Holes," and we shall use the column headed 28′. Opposite the figure 4.0, we find 112; the closest factor to .26 is 2.5 so we take 1/10 of 70 or 7. Then, 112 plus 7 equals 119, the pounds of explosives to be used per hole. In actual practice 120 pounds may be used.

Syria as a Cement Market

By **HAMILTON GORDON**
British Representative, Universal Trade Press Syndicate

European cement producers have their eyes firmly fixed on Syria as a consumer of cement. The possibilities of that market seem very considerable. During the past three years the import of cement through the port of Beyrout alone has increased by 80 per cent. Most of the cement used in the country enters through that port and the progressive nature of the demand is well illustrated by the Beyrout import figures, which has been as follows:

Year.	Metric tons.	Year.	Metric tons.
1911	3,329	1921	7,945
1913	2,299	1922	17,782
1919	1,039	1923	22,947
1920	7,943	1924	31,235

The country is being developed very rapidly. Constructional work of every kind is being undertaken. New roads and bridges are under construction everywhere, houses are being built extensively and many already existing are having a story or two put on. On all hands reinforced concrete is being used instead of stonework in the larger towns and their environs, Beyrout, Aleppo, Damascus, and Tripoli affording particular examples of such development.

At present the business is in the hands of cement producers in Belgium, France and Italy. Belgian cement is used to a far greater extent than any other because the Belgians are able to quote particularly low prices owing to the favorable freight rates they can obtain from their national shipping lines. During the last year or two, however, where price has not been so much of consideration in the case of the erection of certain public buildings, the contractors have shown a preference for French cement. France is commercially influential in Syria and it is therefore highly probable that her share of the cement trade will increase considerably during the near future.

Germany does a small business in certain cements from the Heidelberg district but is placed at considerable disadvantage by tariff discrimination against her products. For countries not forming part of the League of Nations cement is dutiable to the extent of 30% *ad valorem* reduced to 15% where it is specifically entered for use in building operations. Countries adhering to the League of Nations, together with the United States and Turkey, receive a preferential rate of 15% reduced to 11% in the same way. The higher duties make it somewhat difficult for German cement producers to compete successfully on the Syrian market.

As in other countries most cements are sold under the brand names of the manufacturers though there is a certain import in bulk which is put up in sacks and sold under names which have only local significance.

There are few rules governing the cement business. The imports are nearly all made through Beyrout so that this naturally becomes the headquarters of the foreign cement manufacturer. The local agent in Beyrout usually works on commission and holds a considerable stock, but business is in some cases done direct by exporters abroad with wholesalers and stockists throughout the country, who are mainly interested not only in the trade in cement but in building materials generally. In such cases payment is usually collected through a bank against presentation of documents on arrival of the shipment. However, exceptions to this rule become increasingly more frequent and terms of 60 to 90 days' credit are frequently arranged. Foreign firms should make very careful enquiries before credit is accorded and should at least obtain the acceptance of a bill before delivery takes place.

The Syrian monetary system is based on that of France. A Syrian pound is equivalent to 20 francs and varies in value according to the fluctuations of the latter. In quoting prices for this market, therefore, the best plan is to calculate them in francs.

Cement is usually imported in sacks of 50 kilos (approximately 1 cwt.) and in barrels containing about 400 lb. The latter method is slowly dying out on account of difficulties of handling and transport within the country. Beasts of burden, such as camels and mules, have to be used for transporting cement to the interior and sacks are therefore much more convenient. In the case of the camel the load has to be divided into two equal parts, one for each side of the beast. His total effective load is about 4 cwt. Sacks must be strong owing to the considerable amount of handling they will receive and the cement should be insured against all risks to destination. Quotations should always be made C. I. F. Beyrout.

In these days when fresh export markets are being continually sought for, not even the smallest outlet can be disregarded, and from the trend of events it would appear a certainty that within the next few years Syria will become a very considerable consumer of cement.

Census of Manufactures: 1925

The Bureau of the Census is making plans for the next biennial census of manufactures, which will cover the year 1925, as provided in the Act of Congress approved March 3, 1919.

In deciding upon the items to be covered by the census, the bureau has consulted with the representatives of various manufacturers' associations with a view to securing, as far as practicable and without making the schedule too elaborate, information which will be of value to the representatives of the several industries concerned, and at the same time furnish a record of the progress of manufactures generally throughout the United States.

The blank forms upon which reports should be made will be mailed by the bureau to all manufacturers about January 1, and a report will be required from each manufacturer whose gross products are valued at $5,000 or more for the year 1925. It is to be hoped that every manufacturer concerned will have his records in such shape that he can fill out the schedule within a few days after its receipt, as the tabulation of each industry will not be made by the Bureau of the Census until reports are received from all manufacturers engaged in it. Readers are urged to furnish this information, in case they are manufacturers, soon after January 1 in order that the statistics which will show the condition and record of their industry for the year 1925 will be available as early as possible in 1926.

Exposition Records Progress in Power and Mechanical Engineering

The Fourth National Exposition of Power and Mechanical Engineering during the week of Nov. 30 through Dec. 5, attained the ideals of its originators for its diversified and well balanced display of valuable exhibits of power and mechanical engineering apparatus. In the number and diversity of exhibits, in attendance and in enthusiasm of both spectators and exhibitors this exposition was far ahead of its predecessors.

Visitors including engineers and executives in industrial and power fields came from all over the United States and from twenty-three foreign countries including England, Scotland, France, Germany, Sweden, Norway, Egypt, Natal S. Africa, India, China, Manchuria, Japan, Australia, Philippines, Argentine, Chili, Peru, Colombia, Porto Rico, British West Indies, Cuba, Mexico and Canada. The plan of sending out invitations for the show, which was put into effect for the first time this year, brought those who were vitally interested in the exhibits.

Steam-Electric Power Plant Equipment

There were exhibits of over 400 manufacturers representing leaders in the entire mechanical field. There were splendid showings of heating and ventilating apparatus, refrigerating machinery, machine tools and power transmission apparatus, as well as a complete representation of all types of apparatus in the power field. All of the large manufacturers of equipment for steam-electric power plants were represented at the show.

Viewing the Exposition as a whole, the outstanding characteristic was the large number of working models and full size showings of apparatus, including stack breechings, economizers, super-heaters, stokers, coal pulverizers, air compressors, large motor operated valves, and several showings of combustion control apparatus in operation. Working models included a coal pulverizing plant, several boilers with one side cut away and covered with glass, coal pulverizing and conveying equipment and coal handling devices.

The progress made during the past year as reflected by the exhibits brought together under the one roof was astounding proof of the increasing importance of the part that power generation and use plays in modern industry.

Among the novelties displayed were four new types of unit pulverizers for powdered coal, a new type of water-cooled furnace wall consisting of tubes to which were clamped carborundum-faced cast-iron blocks, several types of mechanically and electrically operated combustion-controlled systems and a four cylinder crankless Diesel engine where the four cylinders parallel to the shaft worked on a swash plate keyed to the shaft.

New Type of Boiler

Combustion apparatus occupied a large place in the Exposition. Boilers were of necessity shown mainly by working drawings; one display was that of a new single-pass boiler. One manufacturer showed a new form of forged-steel header. There were five showings of air-preheaters. Economizers were well represented and included one novelty in the form of a steel economizer with lead-coated tubes.

Pulverized Fuel Apparatus

The rapidly increasing importance of pulverized fuel was indicated by many exhibits of all types of apparatus used in its preparation and burning. These included pulverizers, feeders, transport systems, and burners. There was also a feeder and meter for delivering and measuring pulverized coal from storage bins to burners.

There were many stoker exhibits of hand and power operated types. Oil burning equipment was presented by eight manufacturers. Novelties in this field included burners for the use of either pulverized coal or oil.

Tremendous strides in perfecting schemes of combustion control were reflected by many excellent showings of new devices, to operate either electrically or mechanically from steam pressure, air flow, load changes, etc.

Developments in gages, meters, and recording instruments were mainly in the direction of securing easier reading instruments and in eliminating errors of reading and calibration. These instruments included all types of devices for measuring and recording the flow of air, steam and water and temperatures and CO_2 content.

Refractories

The strides that are being made in solving refractory problems were revealed in a series of highly interesting exhibits. Hollow furnace side walls for air cooling, the use of carborundum blocks, new cements, and simple methods for their application were among the interesting showings.

Steam Turbines

There were several large size commercial steam turbine units on exhibition. There were also several very interesting showings of small steam turbines for direct connecting or gearing to electric generators with ratings as low as 5 k.w.

The exhibits of electric equipment included many types of direct and alternating current motors, a mercury arc battery changing set and several lines of switchboard and portable instruments, couplings and underground conduit systems.

Great interest was aroused by the exhibit of a typical steam accumulator installation with its connecting valves and pipe lines. The showing of the cylinder, piston and piston rod of a double-acting Diesel engine which had been operated 1,300 hours attracted a great deal of attention.

Better Patent Office Conditions

The Department of Commerce announces a decided improvement in the status of work at the Patent Office is shown in the first detailed report submitted to the Secretary of Commerce since the Office was transferred to the Commerce Department, April 1 last.

Despite the receipt of 1900 more new applications and 30,000 more amendments than during the previous year, Commissioner of Patents Robertson in his statement to Secretary Hoover, reports that the close of the last fiscal period found the Patent Office with 16,000 fewer cases awaiting official action than a year ago.

There were only 43,000 cases pending on June 30, last, against 59,000 a year ago; 72,475 on June 30, 1923; and 67,608 at the end of the fiscal year 1922.

A year ago but one examining division had its work less than three months behind. There are now 5 under 2 months and 14 under 3 months.

Thirty-six divisions have succeeded in reducing their work to a four-months basis against only 2 in this class last year, while 48 others have gotten their work to a 5 months basis against only 8 in this class a year ago.

According to the Patent Commissioner's report, during the year just closed his Office has decreased the average time that application must await official action by 2 months in new work and 1 month in old work so that the average time that a new application must await to receive official action has been reduced from 5 months to 3, and the average time an amended application must await official action has been reduced from 3.4 months to 2.3 months.

Portland Cement Output in November, 1925, Shows Seasonal Decrease

Production and shipments of portland cement in November show the expected seasonal decreases, according to statistics compiled by the Bureau of Mines, Department of Commerce. As compared with the corresponding period of 1924, production shows an increase, shipments a slight decrease, while stocks are nearly 62% greater. The following tables prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines are compiled from reports for November, 1925, received direct from all the manufacturing plants except one for which estimates were necessary on account of lack of a return.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1924 AND 1925, IN THOUSANDS OF BARRELS

	Production		Shipments		Stocks at end of month	
Month—	1924	1925	1924	1925	1924	1925
January	8.788	8.856	5.210	5,162	14,155	17,656
February	8,588	8,255	5,933	6,015	16,815	19,689
March	10.370	11,034	8,995	10,279	18,189	20.469
First quarter	27,746	28,145	20,138	21,456	—	—
April	11,726	13,807	12,771	14,394	17,159	19,877
May	13,777	15,503	14,551	16,735	16,403	18.440
June	13,538	15,387	15,036	17,501	14,903	16,409
Second quarter	39,041	44,697	42,358	48,630	—	—
July	14.029	15,641	16,614	18,131	12,319	13,896
August	15.128	16.419	16,855	18,383	10,666	11,952
September	14,519	15.939	16.827	17,711	8,404	10,247
Third quarter	43.676	47.999	50.296	54.225	—	—
October	14.820	15,992	17,160	15.309	6,073	*10,979
November	13,141	13,639	10,289	10,169	8,928	14,450
December	10,435	—	5,506	—	13,913	—
Fourth quarter	38.396	.. ..	32.955			
	148,859	—	145,747	—		

*Revised.

ESTIMATED CLINKER (UNGROUND CEMENT) AT THE MILLS AT END OF EACH MONTH, 1924 AND 1925, IN THOUSANDS OF BARRELS

Month	1924	1925	Month	1924	1925
January	5,458	7,017	July	6.646	6,961
February	6.905	8,497	August	5.367	5.640
March	8,271	9,962	September	4.260	4.561
April	8,545	9,731	October	3.548	†4.086
May	8,225	9,053	November	4.025	5.004
June	7,609	7,937	December	5,433	. . .

†Revised.

IMPORTS AND EXPORTS‡

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES, AND BY DISTRICTS, IN OCTOBER, 1925

Imported from—	District into which imported	Barrels	Value
Belgium	Massachusetts	19.397	$28.017
	New York	1.191	2.400
	Philadelphia	23,216	34.301
	Florida	60,534	93.069
	Mobile	24,140	48,492
	New Orleans	25,099	39.149
	Los Angeles	16.907	20.893
	San Francisco	9,472	12,197
	Oregon	23.532	39.063
	Washington	2,002	2,892
	Hawaii	35.745	47.117
	Total	241,235	367,590
Canada	Maine and New Hampshire	95	285
	Vermont	5,386	7.713
	Saint Lawrence	137,361	214.397
	Buffalo	8,710	13,360
	Florida	46,563	65,543
	Oregon	137	351
	Total	198,252	301.649
Cuba	Florida	43	153
Denmark	Porto Rico	41,976	63.578
France	Los Angeles	8,310	12,175
	San Francisco	256	533
	Washington	274	704
	Total	8,840	13,412
Japan	San Francisco	—	10
	Hawaii	250	412
	Total	250	422
Norway	Maine and New Hampshire	3,003	4.782
	Massachusetts	34,434	61.915
	Florida	6,708	10,065
	Total	44,145	76,762
United Kingdom	Washington	351	855
	Grand total	535,092	824,421

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN OCTOBER, 1925

Exported to—	Barrels	Value
Canada	1,326	$6,653
Cuba	27,893	64,633
Other West Indies	5,887	13,014
Mexico	8,388	24,150
Central America	3,146	9,739
South America	23,836	92.315
Other countries	2,893	17,963
	73,369	228,467

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, AND PORTO RICO, IN OCTOBER, 1925‡

	Barrels	Value
Alaska	971	$3,227
Hawaii	3,376	8,274
Porto Rico	6,415	14,230
	10,762	25,731

‡Compiled from records of the Bureau of Foreign and Domestic Commerce and subject to revision. Imports and exports in November, 1925, not available.

The World Trade in Portland Cement

By E. LEE HEIDENREICH

According to "ZEMENT" Sept. 3, 1925, the export of Portland Cement from Belgium in the first two months of the year, were as follows:

	Tons
Holland	38,038
United States	29,238
France	18,096
England	14.835
Argentine	14.804
Egypt	10,703
Brazil	9,186
Syria	5,226
Antilles	1.873
West Africa (French)	1,701
Belgian Congo	1.243
Morocco	785
Germany	686
British India	454
Chile	379
Norway	300
Mexico	198
South Africa	141

Ireland imported during 1924 Portland Cement as follows, in tons:

	Tons
England	62,356
Belgium	12,598
France	5,642
Other Countries	666

The status of the cement industry in Germany may be gleaned from the following showing during the months of May and June, 1925:

	May	June
Imports in tons	72,120	91,265
Last year	23,228	21,851
France	13,635	11,958
Alsace-Lorraine	8,405	15,027
Austria	21,920	26,760
Switzerland	20,708	25,619
Exports	765,279	664,055
Last year	338,246	386,409
The Saare	39,640	46,638
Greece	20,780	3,235
Great Britain	2,743	3,690
Lithuania	2,688	159
Latvia	4,559	12,941
Holland	227,422	170,478
Norway	14,994	11,410
Egypt	27,446	34,394
British South Africa	901	5,138
British West Africa	4,128	5,116
Portuguese West Africa	6,491	3,367
British India	13,571	8,281
Holland India	23,342	14,656
Palestine	30,810	39,370
Argentine	60,728	58,532
Brazil	127,831	84,384
Chile	18,222	35,530
Columbia	14,450	9,554
Cuba	......	4,250
Ecuador	3,655	5,225
Peru	39,900	27,396
Venezuela	14,380	33,184
United States, America	1,552	172

Double Worm Gear Speed Reduction Units

By FRANCIS A. EMMONS

For ordinary manufacturing operations the ratios of speed reduction required between prime movers and driven machines, are generally within the range that is covered by standard spur and worm gear reduction units as produced by a number of well known manufacturers.

Standard worm gear speed reducers generally provide reduction ratios ranging from 7 to 1 up to 120 to 1 and spur gear reducers, ratios as high as 320 to 1 in a single enclosed unit.

There are, however, special drives for a number of different purposes where the driven machine moves at exceedingly slow speeds, some of them requiring several minutes or sometimes hours to complete a definite machine cycle. Machines of this kind are assembly conveyors in automobile factories, conveyors for enameling ovens, annealing ovens, rotary furnaces, lehrs in glass factories, escalators, etc.

Very large ratios of speed reduction are required to step down the speeds of commercial high speed motors to the speed required on the final drive of this class of slow moving machinery and equipment. In some special cases the speed reduction mechanism must provide reduction ratios of several thousand to 1 and in the case of lehrs in glass factories, this ratio is often as high as 50,000 to 1.

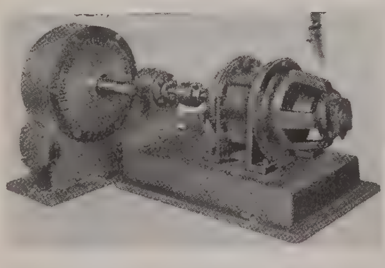
Since the practical limit of speed reduction obtainable with a single unit speed reducer is about 320 to 1, at first thought it might seem that it would involve very complicated transmission and gearing equipment to secure the desired speed for final drives of these ultra slow moving machines.

As a matter of fact, these high reduction ratios may be easily secured by combination units, consisting of two or more spur or worm gear reduction units, or combinations of the two in a series formation.

When a motor is connected to one reduction unit and the slow speed shaft of the first unit is connected to the high speed shaft of the other, they are said to be connected in a series and the resulting reduction ratio is equivalent to the *product* of the ratios of the individual machines.

Thus, if two worm gear speed reducers, each having a reduction ratio of 100 to 1, were connected in this manner, the total reduction over all would be 100x100 or 10,000 to 1.

To meet the demand for a reasonably priced efficient practical speed reduction mechanism for very high reduction ratios, the Foote Bros. Gear & Machine Co. of Chicago have recently added to its complete line of spur and worm gear speed reducers a new line of double worm gear reduction units as illustrated below.



Foote Bros. IXL double worm gear reduction unit

The unit, as will be seen from the illustration, consists of two worm gears compactly mounted together and enclosed in a single enclosed oil and dust proof case provided with automatic lubrication.

The worm of the first drive is direct connected to the motor by a Foote flexible coupling of the pin type and drives a worm gear mounted on another shaft extending at right angles to the worm shaft. The second worm is rigidly keyed to this shaft and in turn drives the worm gear of the second unit, the shaft of which serves as the driving shaft for the machinery or equipment with which the unit is used.

Worm gears are of semi-steel or of English bronze, as desired, and worms are cut from alloy steel. Heavy bronze bearings are used on worm gears and ball thrust bearings on both ends of worms.

The particular unit illustrated above has a reduction ratio of 3600 to 1 and is used for driving a conveyor. The motor is of the variable speed induction type and runs at different speeds from 1200 to 1800 r.p.m.

The manufacturer produces these units in a large variety of sizes and reduction ratios ranging at high as 14,400 to 1 in the single unit type. Higher ratios up to any practical limit may be secured when desired by combination of worm and spur gear reducers, some actual installations having been already made with ratios of 50,000 to 1.

The double worm reduction units are silent and smooth in operation, compact and safe, and they provide a very effective and satisfactory means of power transmission where high reductions are required.

---

*Foote Bros. Gear & Machine Co.

National Cement Plant to Start Production

The National Cement Co. of Montreal, Canada, will soon have its modern 3,000-barrel, dry process cement mill in production. The new plant will be completely electrified, power being purchased at 12,500 volts, 60 cycles, 3 phase from the Montreal Light, Heat & Power Co.

Motors furnished by the Canadian General Electric Co. for the new National cement plant near Montreal. The motors are of the super-synchronous type

Complete electrical equipment for the operation of the quarry and mill has been purchased from the Canadian General Electric Co., including several motors of 200, 300, 350 and 500 horsepower. The 500-horsepower motors, four in number, will drive tube mills and are of the super-synchronous type, correcting the power factor of the induction motor load. Throughout the plant there is a large number of motors of various ratings for general and specific duty.

Full provision has been made for doubling the capacity of the plant without disturbing the present layout. A waste heat power plant is contemplated and provided for in the general plan.

Cost of Electric Motor Burn-Outs

By W. F. SCHAPHORST

Two or three years ago I tried to learn from several sources the cost of electric motor burn-outs but was unsuccessful in my efforts. These seemed to be no information on the subject.

Just recently some figures have come into my possession concerning a factory in which nearly 5,000 electric motors are operated—the total power consumption being slightly over 40,000 h.p. To be exact, the average of each motor is figured as 8.92 h.p.

The statement shows that they average over 100 burnouts every year. The total cost of rewinding the motors is given. Applying my slide rule I find that it amounts to $83.80 for each motor burned out.

Nothing is said about the other costs such as the cost of holding up production, cost of idle labor during the breakdown period, etc. But the above information alone is valuable and interesting and I am sure it will be welcomed by all users of electrical motors. Possibly some readers have further facts regarding the cost of motor burn-outs that are worth publishing.

The Binding Properties of Cements

By DR. ING. OTTO MERINSKY

Instructor Vienna School of Technology

With reference to the binding properties of portland and Roman cement the official Austrian regulations specify:

Quick binders are those cements in which the hardening process in air without admixture of sand begins within 10 minutes. Slow binders begin to harden after 30 minutes or later. The German standard rules specify that the hardening of normally binding portland cement should not begin sooner than 1 hour after mixing. If quick binding cement is desired for special purposes it has to be labeled as such expressly. Denmark's rules also state that portland cement should bind slowly and that quick binding cement may be supplied upon specific order only. Here also the hardening should not begin under one hour and should not exceed 15 hours. Switzerland calls quick binders those which harden within 30 minutes. If the process lasts longer than 3 hours they are called slow binders. The Swedish standards specify that the binding should not start before the one hour after mixing. Other portland cement has to be labeled "Quick Binder."

A disagreeable feature is the sudden shifting in the binding property of cement, which at times occurs during storage of cement. Decomposition of the cement particles probably accounts for this fact. In order to make portland cement slow binding raw gypsum is added, the gypsum acting as catalyctic agent. During the mixing a thin coating of gypsum covers each cement particle, thus delaying the action of the water upon the cement. If during storage the cement particles decompose and thereby increase their surface, the quantity of gypsum is no longer adequate and the binding is quickened.

Dr. Paul Rohland in his book "Portland Cement From the Physico-Chemical Standpoint" says: The finely pulverized condition of portland cement which increases during its storage through decomposition alters and increases its active qualities upon liquid and solid bodies. On account of this activity the structure or composition of portland cement can change during storage. A reversion of the hydration speed calls for the creation of one or several catalytic agents. Positive catalytic agents increase the hydration speed, i.e., decrease the binding time. According to Rohland the formation of such positive catalytic agents in portland cement is made possible by the presence of alkalis and aluminates.

The changing of the binding property of a cement is an unavoidable occurrence and manufacturers can not be held responsible for such turning which occurs during storage.

Process of Making Titan Cements

A patent, No. 1,555,405 was granted September 29, 1925, to Edwin C. Eckel, Washington, D. C., covering a process of making cement and iron embodying the use of titaniferous iron ore resulting in the production of metallic iron and a cement containing a titanic constituent, which cement has valuable technical properties among which may be mentioned high specific gravity, resistance to chemical attack, and quick hardening properties.

It is stated in the patent paper that the invention has for its object to produce a titan cement or one having a titanic constituent, by a process which is particularly applicable and economical in regions where titaniferous ores and coke are both expensive, the titaniferous constituent being introduced otherwise than by the reduction of the mixture containing titanic ore, involving necessarily the ommission of iron recovery, as well as producing a cement by the process disclosed in the patent.

The process is reviewed in the patent as including the use, as one component of a cement mixture, of an artificially prepared titanium compound, either a titanium silicate or a calcium titanate or a mixture of both, as distinguished from the natural titanic iron ore.

This artificially prepared titanic compound is added, in proportions suitable to give the final tenor in titanium oxide or other titanic compound desired, to a cement mixture already containing proper amounts of lime, alumina and silica.

The addition of the "titanium base" may be made either before clinkering or fusion or during the actual burning; and the final product is in either case cooled and ground to powder to form the cement.

As an example, in order to make a high-lime titan cement for manufacture in a rotary kiln, the final raw mixture may be composed of 120 lbs. of limestone, 15 lbs. of clay or bauxite, 25 lbs. of titaniferous slag.

The titaniferous slag may for example be the slag resulting from the fusion of the titaniferous iron ores and limestone. The result with these three raw materials of normal composition would be about 100 lbs. of titan cement, with a composition ranging around lime 60%, silica 10%, titanic oxide 15%, alumina 10%. The titanic oxide may assume the form of an equivalent calcium titanate, exceeding 10%.

By the use of such a prepared titanium compound sufficient titanic oxide or corresponding compound is introduced by the process into the cement mixture, in a readily combinable form, to secure the increased density and chemical resistance which are characteristic of all the titan cements, as compared with alumina cements, portland cements, or any other earlier types.

The process is adaptable to the use of either a rotary kiln or furnace, to either clinkering or fusion, and to the use of coke, coal, electricity, gas or oil as fuel. It also permits the attainment of very high lime titanium cement compounds, which were difficult to attain by direct fusion of a limestone—titaniferous iron ore mixture—though the low lime quick hardening titan cements are prepared easily enough even at relatively low temperatures directly from the ore. The present invention provides a new method of introducing a titanium constituent into a normal cement mixture, with the advantages heretofore referred to, and without the incidents attending the use of titaniferous iron ore and the necessity for example of using a blast furnace.

Men and Mills

Notes from the Field

Colonel Hanford MacNider of Iowa, former commander of the American Legion, has been appointed Assistant Secretary of War to succeed Dwight F. Davis, who became Secretary of War and was sworn in October 14, in place of John W. Weeks, resigned. Col. MacNider, who was born in Mason City, Iowa, in 1889, has been referred to as the youngest member of the President's "Little Cabinet." He is the possessor of a Distinguished Service Cross and won several other honors.

The daily output of the Olympic Portland Cement Company's plant at Bellingham, Washington, will be 3,000 bbls. when the improvements now under way are completed. It is estimated that the improvements will cost about $350,000. The main factory building will be widened and a new 9x10x170-ft. kiln added, together with a new stack and necessary auxiliary machinery for the new unit. It is expected that the new kiln will be in operation by the spring of 1926.

Willard G. Reid of the law firm of Reid and Fishel of Babylon, N. J., and formerly a director of the Edison Portland Cement Co., died recently at King's Hospital, Bay Shore, at the age of 53 years.

Several buildings, including a large barn belonging to the Dexter Portland Cement Co., were burned to the ground recently with the resultant loss of all of the season's crops from the company's farm.

The storage capacity of the Alpha Portland Cement Co. plants at Martin's Creek, Pa., will be approximately 900,000 bbls. of cement by January 1, 1926, when the new packing plant now under construction by the Macdonald Engineering Co., Chicago, Ill., is completed.

At a recent meeting of the board of directors of the American Lime and Stone Co., Bellefonte, Pa., the addition of another 9x175-ft. rotary kiln was authorized. This will be a duplication of the company's present rotary kiln lime plant, but does not include any additions to the stone crushing, screening or hydrating equipment.

Actual field work was begun October 1 and it is expected to have the plant completed early next year. Arthur C. Hewitt is engineer in charge of design and construction and W. R. Cliffe is field superintendent.

C. E. Phillips has been appointed representative in charge of Wilkes-Barre office of the Allis-Chalmers Mfg. Co. Mr. Phillips, who was formerly connected with the Philadelphia office of the company, succeeds Guy V. Woody.

The Allis-Chalmers Mfg. Co. has opened a new district office in Lima, Peru, in charge of W. G. Bolton. This office, as well as the one at Oruro, Bolivia, is a branch of the company's office at Santiago, Chile, of which W. R. Judson is manager. The Oruro office is in charge of P. G. Gilliard, succeeding Erling Winsnes, who has returned to the United States.

F. L. Smidth & Co., engineers, designers of cement factories, are making a $100,000 addition to their factory at Elizabeth, New Jersey, to take care of constantly increasing business. The Smidth Co. has its own machine shop and foundry and also technical laboratories at Elizabeth.

The Ideal Cement Company has declared its regular quarterly dividend of $1.75 on the preferred and $1 on the common, both payable Jan. 2 to stockholders of record December 15. In addition they declared an extra of 50 cents on the common and this will be paid December 22 to stockholders of record December 15.

D. S. MacBride, who was formerly connected with the New York office of the International Cement Corporation, has been made manager of the International's subsidiary company, the Indiana Portland Cement Co., with offices at Indianapolis.

A. D. Stancliff, formerly connected with the Atlas Portland Cement Co., at the Northampton plant, is now connected with the Louisiana Portland Cement Co., with offices at 901 Hibernia Bank Bldg., New Orleans, Louisiana.

The Giant Portland Cement Co. declared the regular semi-annual dividend of 3½% on the preferred and an extra dividend of 10% on the accumulation of the preferred stock. Both were payable December 15.

The Portland Cement Association named J. R. Fairman district engineer in charge of the Birmingham office, as assistant general manager in charge of the Southeastern territory, effective December 1, when he assumed his new duties in Atlanta.

A company has been formed in Pola, Italy, with 10,000,000 lire capital which will use the old Austrian arsenal as a factory for manufacture of portland cement. The company is pledged to produce 6,200,000 centals annually in consideration of government concessions to it.

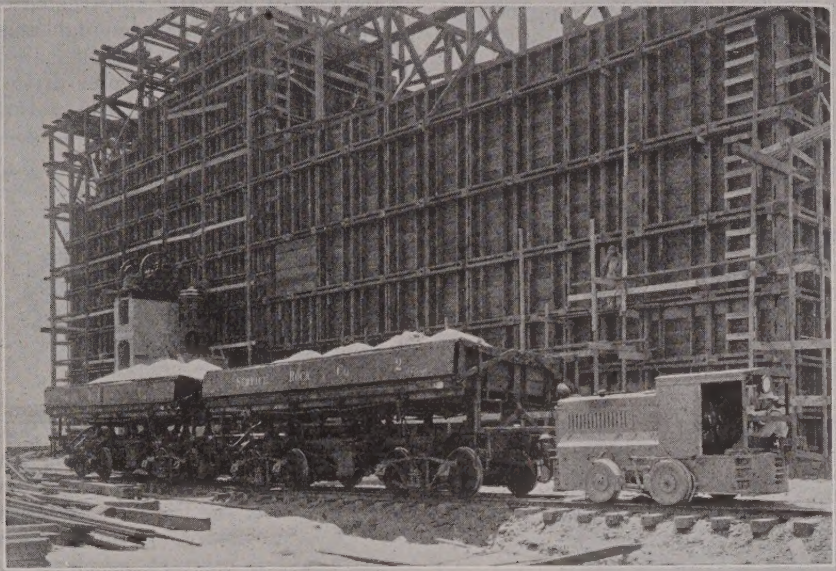
In view of the report that the contractors constructing the approaches of the Burnside street bridge, Portland, Oregon, were going to use foreign-made cement, D. J. Malarkey, representing American manufacturers of cement, appeared before the county commissioners and called attention to a clause in the contract which provided that in case foreign cement is used it must be inspected at the mill by a recognized American testing agency. Resident engineer explained that the requirement would be observed and that in addition the cement would be tested after its arrival in Portland before being accepted.

Trade Publications

A four page folder has been issued by the Republic Flow Meter Co., Chicago, Ill., entitled *Draft Instruments.* The folder is 8½ in. x 11 in. and describes and illustrates the new Republic multiple draft indicator. This new instrument is claimed to have many advantages, chief of which is set forth as the fact that all readings are on one eye level thus making for the greatest possible ease in reading. The zero setting is permanent for each unit. Its usual application in connection with boiler installations is described.

Brown Recording Pressure and Vacuum Gauges, Catalog No. 74, issued by the Brown Instrument Co., Philadelphia, Pa., contains much valuable information on the equipment designated in the title. The booklet is 8½x11 in., witb 32 pages and paper covers. Some typical interesting charts are reproduced and pointers included as to what they show. A table for drilling dimensions of Brown recording pressure and vacuum gauges is included.

Western Cars "Stand Grief"



Western 20-yard air dump cars at the crushing and screening plant of the Service Rock Company, Fresno, California.

No matter how large or complicated your job of stripping or hauling material from the quarry, there is a Western Dump Car that will do the work economically and will stand up under hard service.

The California operation shown in the picture used Western 20-yard air dump cars loaded at the pit by a 5-yard dragline. Local conditions at other plants may make the 4-yard narrow gauge or the 6-yard standard gauge Westerns more economical.

But whatever the size, Western cars, as one superintendent expressed it, "WILL STAND MORE GRIEF THAN ANY OTHER CAR THAT IS MADE." Dump cars in quarry work need to be able to stand grief.

Let us explain to you why Western Dump Cars will stand grief. Write to-day.

Western

That's Why

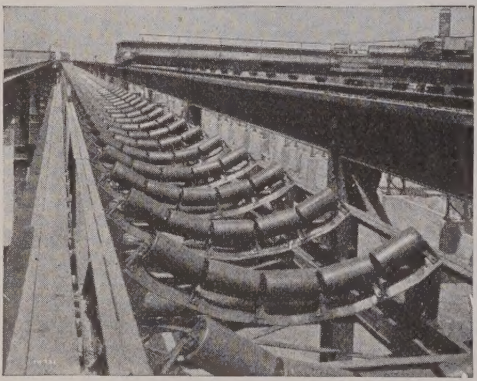
Western Wheeled Scraper Company
Founded 1877
Earth and Stone Handling Equipment
AURORA, ILLINOIS

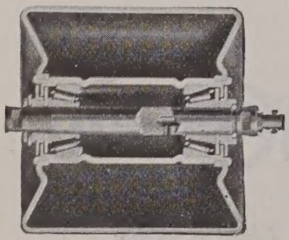
Roller Bearings at Peerless Cement Plant

The advantages of roller-bearings in motor and countershaft drives are becoming thoroughly recognized. Their use in conveyors, bucket elevators, etc., has not, however, received so much attention.

Nevertheless, the economy, especially on long conveyors, may be considerable; as the Peerless Portland Cement Co. of Detroit, Mich., recently discovered in connection with the installation of a material-handling equipment at their new $3,000,000 plant.

This conveyor installation, which was designed and manufactured by the Stearns Conveyor Company, Cleveland, Ohio, was for the purpose of handling coal and limestone from the unloading points—the railroad tracks and the dock—to the respective storage piles. It consists of four conveyors, averaging 400 ft. in length. It was decided to install the Stearns standard Timken roller-bearing troughing idler pulleys and return rollers, instead of the less efficient plain bearings commonly used in conveyor drives.





Top—The 590-foot conveyor and belt tripper which feeds the limestone storage piles at the Peerless Portland Cement Co. plant
Left—Sectional view of idler pulley showing bearing construction, grease reservoir, grease seal, and the pressed steel pulley shell

It is said that, notwithstanding the somewhat higher cost of this type, the result was more economical in overall cost and in operating and maintenance expense than would have been the case had the plain bearing type been installed. On one conveyor, for instance, which was 590 ft. long by 54 in. belt width, the saving in driving power alone amounted to 35 per cent. This was by no means all the saving effected, however, for in view of the reduced horsepower to be transmitted, and the consequent lessened strain on the belt, it was perfectly satisfactory to use an 8-ply belt instead of the 12-ply belt which would otherwise have been required.

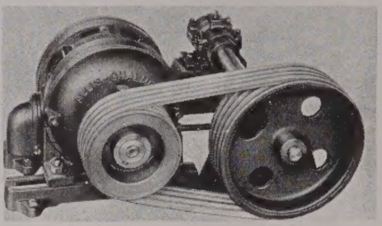
The reason for these economies, as compared with the plain bearing type of conveyor idler pulleys, is that although the difference in efficiency between the two types is only about 1.2 per cent per pulley, the large number of pulleys employed in the average conveyor renders the saving cumulative, according to the manufacturers.

The Texrope Drive

An important development in the field of power transmission machinery has just been announced by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., who have recently perfected an entirely new type of short center, flexible drive, known as the Texrope Drive.

The Texrope Drive consists of two grooved sheaves and a number of specially constructed endless "V" belts. The sheaves are set just far enough apart so that the belts fit the grooves without either tension or slack.

Previously no short center drive existed which did not have slip, back lash or lost motion, which caused jerky starting and uneven running. Since the Texrope belts just fit the sheaves, there is no slack or lost motion in the drive. Because of the "V" construction, they cannot slip, as the harder the pull the more firmly the belts grip the grooves. Being elastic and stretchable, they cannot jerk, either in starting, acceleration or running, nor can they transmit vibrations, but act as cushions between the driving and driven machines. Therefore, according to the manufacturers, smoothness of transmission never attained before is delivered by the Texrope Drive, as opposed to the series of linear pulsations delivered by the ordinary short center drive.



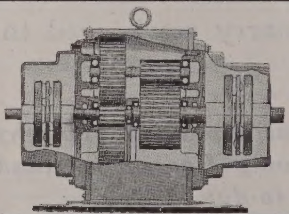
Model of new Texrope Drive developed by the Allis - Chalmers Mfg. Co.

Bearing pressures are low, since no belt tension is employed. The drive occupies very little space. It is silent, perfectly clean, unaffected by moisture or dirt, and is safe, simple and trouble proof.

Texrope Drives from ½ to 250 H. P., with ratios up to 7 to 1 and belt speeds from 800-6000 feet have already been placed in service.

A New Speed Transformer

The accompanying diagram illustrates the construction of the new ball-bearing speed transformer recently announced by the Albaugh-Dover Manufacturing Co., 2100 Marshall Blvd., Chicago, Ill. These speed transformers are recommended by the manufacturers for use in place of exposed drives of belts, chains, or gears on individual machine drives, multiple machine drives, conveyors, elevators, line shafts, etc. They can be located in out-of-the-way places on columns, walls or ceilings.



The Albaugh - Dover ball-bearing speed transformer with section of housing removed to show gear arrangement.

Points of advantage claimed for these transformers include: full ball-bearing throughout; low cost of maintenance with minimum amount of attention; only one set of shafts for single, double, triple and quadruple sets of reducing or increasing driven speeds; couplings are enclosed for safety and cleanliness by direct attachment to the reduction gear housing as one neat and compact unit.